



SECTION 726

RIGID PIPE CULVERTS, STORM DRAINS AND SEWERS

726.1 Description.

726.1.1 This work shall consist of concrete and vitrified clay pipe of the diameter or shape designated, laid upon a bed as specified on the plans and backfilled as specified.

726.1.2 The contract will specify either the type of pipe or the group of permissible types of pipe. If Group B pipe is specified, the contractor shall use any one of the types listed as follows:

- Reinforced Concrete Pipe
- Corrugated Metallic-Coated Steel Pipe
- Corrugated Aluminum Alloy Pipe
- Corrugated Polyethylene Pipe

726.1.3 If the contract specifies reinforced concrete pipe, or if the contract specifies pipe culverts by group and the contractor elects to furnish reinforced concrete pipe, the type of installation and the class of pipe shall conform to the requirements as shown on the plans for the applicable allowable overfill height.

726.1.4 If the contract specifies vitrified clay pipe, or if the contract specifies pipe culverts by group and the contractor elects to furnish vitrified clay pipe, such pipe shall be placed in a trench conforming to the requirements as shown on the plans for the applicable allowable overfill height.

726.1.5 If the contract specifies pipe culverts by group, and the contractor elects to furnish metal pipe, the culvert shall be constructed in accordance with [Sec 725](#). If the contractor elects to furnish corrugated polyethylene pipe, the culvert shall be constructed in accordance with [Sec 730](#).

726.1.6 If the contract specifies non-reinforced concrete pipe, the contractor may, at no additional cost to the Commission, furnish reinforced concrete pipe of like sizes meeting the requirements of these specifications.

726.1.7 If reinforced concrete pipe is specified in the contract or elected for use by the contractor, pipe of a higher class may be used but payment will be made for the class of pipe specified in the contract for that culvert.

726.1.8 The class of pipe or type of installation shall not be changed throughout the length of any individual pipe culvert.

726.1.9 The type of pipe permitted in extending an existing pipe shall, in general, conform to the type used in place, except as otherwise specified in the contract, or unless prohibited by any of the requirements set out herein.

726.1.10 If standard strength vitrified clay pipe is specified in the contract or elected for use by the contractor, extra strength vitrified clay pipe may be used but payment will be made for

standard strength vitrified clay pipe. Only extra strength vitrified clay pipe shall be used under roadways. Standard strength vitrified clay pipe will be permitted only where vehicular traffic is not anticipated.

726.2 Material.

726.2.1 All material shall conform to Division 1000, Materials Details, and specifically as follows:

Item	Section
Reinforced Concrete Culvert, Storm Drain and Sewer Pipe	1026
Vitrified Clay Sewer and Culvert Pipe	1030
Reinforced Concrete Elliptical Culvert, Storm Drain and Sewer Pipe	1034
Reinforced Concrete Arch Culvert, Storm Drain and Sewer Pipe	1035
Plastic Joint Compound for Vitrified Clay and Concrete Pipe	1057.3
Tubular Joint Seal	1057.4
Mortar for Pipe Joints	1066

Construction Requirements

726.3 Laying.

726.3.1 Rigid pipe shall be carefully laid true to lines and grades shown on the plans, with hub, bell or groove ends upstream and with the spigot or tongue end entered the full length into the adjacent section of pipe. Elliptically reinforced pipe shall be oriented and laid such that the top and bottom of the pipe, as marked on the pipe, are in the proper position. If the pipe is to be laid below the ground line, a trench shall be excavated to the required section and depth to permit required compaction of the backfill under the haunches and around the pipe. Any pipe which is not in true alignment or which shows any undue settlement after laying, but before the fill is placed, shall be taken up and relaid at the contractor's expense. If shown on the plans, or directed by the engineer, sufficient camber shall be built into the pipe structure to allow for settlement from fill loads. All joints, except for field or private entrance culverts, shall be sealed with an approved plastic compound, cement mortar or tubular joint seal. Rubber gasketed joints may be used at no additional cost to the Commission. Where permissible lift holes have been used, the holes shall be carefully filled with expansive mortar to provide a watertight section. The mortar shall be finished flush on the inside of the pipe and shall be properly cured on the outside. Lifting devices shall have sufficient bearing on the inside of the pipe to avoid damage resulting from a concentration of stresses around the lift holes.

726.3.2 If rubber gasket type pipe or vitrified clay pipe is specified or used, the joints shall be installed in accordance with the manufacturer's recommendations to ensure that joint devices are properly installed and that rubber gaskets are not displaced.

726.3.3 In sealing rigid pipe with mortar, the mortar contact areas of all pipe ends shall be damp when mortar is applied. After applying mortar to the entire interior surface of the bell or groove, the spigot or tongue end shall be forced into position. Any remaining void in the bell or groove shall be filled with a hub of mortar built up adjacent to the bell, or a bead of mortar built up around a groove-type joint. The interior joints of either type of pipe shall be finished flush with the surface of the pipe. Outside surface of mortar joints shall be cured with membrane curing compound.

726.3.4 In sealing rigid pipe with plastic joint compound, trowel grade compound shall be applied to the mating surfaces of both the tongue and groove, or to the entire interior surface of the bell and the upper portion of the spigot. Rope or tape type plastic compound shall be applied in accordance with the manufacturer's recommendations. The joints shall be forced together with excess compound extruding both inside and outside the joint. Excess compound shall be removed from the interior surface where accessible. Tubular joint seals shall be installed in a manner as recommended by the manufacturer. The joint between the bell and spigot shall be uniform for the full circumference and care shall be taken to prevent the bell from supporting the spigot.

726.4 Bedding.

726.4.1 Bedding for reinforced concrete pipe shall consist of Category 1, Category 2 or Category 3 soils as shown on the plans.

726.4.1.1 Category 1 soils consist generally of a well graded mixture of stone fragments, gravel and coarse sand as well as clean, fine sand. Specifically, these soils shall meet the requirements of AASHTO M 145, classification A1 or A3.

726.4.1.2 Category 2 soils consist generally of non-plastic or moderately plastic granular material with silt content higher than that of Category 1. Specifically, these soils shall meet the requirements of AASHTO M 145, classification A2 or A4.

726.4.1.3 Category 3 soils consist generally of silty clays. Specifically, these soils shall meet the requirements of AASHTO M 145, classification A5, A6 or A7.

726.5 Installation.

726.5.1 The construction sequence shall conform to the following. The bedding shall be placed to the required thickness and grade taking care to avoid compaction of the bedding under the middle one third of the pipe. The bedding outside the middle one third of the pipe may be compacted before placing the pipe. The pipe shall be installed to grade according to [Sec 726.3](#). If not previously accomplished, the bedding outside the middle one third of the pipe shall be compacted to the required density shown on the plans. The material in the haunch and lower side zones shall then be placed and compacted up to the springline of the pipe. The placement of the remainder of the embankment material above the springline shall conform to the requirements of the adjacent fill.

726.5.1.1 Installation of Pipe Prior to Placing Embankment. After the pipe has been laid, the material in the haunch and lower side zones shall be placed to a minimum width of one pipe diameter outside the pipe. The haunch and lower side material shall be compacted to the required densities shown on the plans. When all material has been placed and compacted up to the springline of the pipe, the remaining fill material shall be placed according to the requirements of the adjacent fill. If a subtrench is required to install the pipe to the specified grade, the width of the requirements of the adjacent fill. If a subtrench is required to install the pipe to the specified grade, the width of the trench shall be 1.33 times the outside diameter of the pipe, but not less than 24 inches (600 mm) wider than the outside diameter of the pipe. In this manner, sufficient clearance is provided in order to attain the required compaction in the haunch and outer bedding zones.

726.5.1.2 Installation of Pipe After Placing Embankment. The roadway embankment shall be placed and compacted to the required density to a minimum elevation of one foot (300 mm) below the bottom of the pavement base material. A trench, conforming to the section shown on the plans shall be excavated through the embankment to a depth sufficient to place the

required bedding and maintain the specified grade of the pipe. The pipe shall be installed and backfilled according to the requirements of [Sec 726.5.1](#).

726.5.2 Vitrified clay pipe (extra strength) shall be laid in a trench with a width, on a plane level with the top of the pipe, not greater than that shown on the plans for the respective pipe diameter. The trench shall have a minimum depth of one outside pipe diameter plus 16 inches (400 mm). If the original ground line is below an elevation one foot (300 mm) above the top of the proposed pipe, embankment shall be constructed to at least one foot (300 mm) above the proposed pipe prior to excavating the trench. The trench walls shall be as nearly vertical as practicable. Prior to laying the pipe, the bottom of the trench shall be covered with a 4-inch (100 mm) layer of sand. After laying the pipe, the trench shall be backfilled with sand around the pipe for at least 10 percent of the height of the pipe. The sand shall be thoroughly compacted by the use of tampers or by flooding. The remainder of the trench shall be backfilled in accordance with the requirements of [Sec 726.5.5](#).

726.5.3 Bedding in Unsuitable Material. If rock is encountered, the bedding depth shall be increased to 1/12 the outside diameter of the pipe, but not less than 6 inches (150 mm). The width of the cushion excavation shall be 1.33 times the outside diameter of the pipe, but not less than 24 inches (600 mm) wider than the outside diameter of the pipe. If soft, spongy, or unstable material is encountered, it shall be removed and replaced with soil compacted to the level specified for the lower side zone. Payment for removal of unsuitable material and for backfilling will be made in accordance with [Sec 206.6.3](#), unless the unsuitable material is a result of the contractor's operations in which case the removing and backfilling shall be at the contractor's expense.

726.5.4 Pipe Plugs. The ends of all pipe stubs for future connections at inlet and manhole structures and of all pipe installed as a portion of future sewers shall be sealed with suitable plugs. The plugs shall be installed in a manner preventing infiltration of dirt into the pipe. No direct payment will be made for furnishing and installing plugs.

726.5.5 Backfilling. Backfilling shall be done as soon as practicable. Suitable backfill and embankment material, free from large lumps, clods or rocks, shall be placed alongside the pipe in loose layers not exceeding 6 inches (150 mm) thick to provide a berm of compacted or undisturbed earth on each side of the pipe as shown on the plans. Each 6-inch (150 mm) layer shall be compacted to the required density shown on the plans. Backfill material shall be moistened, if necessary, to facilitate compaction. Special care shall be taken to properly compact the embankment under the haunches of the pipe. Before heavy construction equipment is operated over the pipe, the contractor shall provide an adequate depth and width of compacted backfill to protect it from damage or displacement. Any damage or displacement shall be repaired or corrected at the contractor's expense.

726.6 Inspection. After the roadway has been completed, and before final acceptance of the project, all pipe culverts will be inspected. Any separation at joints sealed with either cement mortar or plastic joint compound shall be resealed with like material.

726.7 Method of Measurement.

726.7.1 Measurement of rigid pipe, complete in place, will be made to the nearest foot (0.5 m) along the geometrical center of the pipe. Final measurement will not be made except for authorized changes during construction, or where appreciable errors are found in the contract quantity. The revision or correction will be computed and added to or deducted from the contract quantity. The length of structure may be increased by not more than 3 feet (1 m) as necessary to avoid cutting the pipe, but such increased length will not be included in the contract quantity for payment.

726.7.2 Excavation for placing rigid pipe culverts will be measured and paid for as Class 3 Excavation in accordance with [Sec 206](#), except if vitrified clay pipe is specified in the contract or elected for use by the contractor, no direct payment will be made for additional excavation required to cut the trench in the embankment above the original ground line. Class 3 Excavation, below a level line one foot (300 mm) above the top of the pipe will be measured to the nearest cubic yard (cubic meter) of that volume actually removed within an area bounded by the vertical planes of the maximum permissible trench width shown on the plans, [Sec 726](#), for the respective pipe diameter.

726.8 Basis of Payment.

726.8.1 The accepted quantities of pipe, complete in place, including all necessary tees, bends, wyes, cutting and joining new pipe to existing pipe, unless otherwise specified, will be paid for at the unit price for each of the pay items included in the contract. The accepted quantities of pipe by groups will be paid for in accordance with the item numbers, pay items and pay units listed in [Sec 725](#).

726.8.2 No direct payment will be made for any backfilling required except as specified in [Sec 206.6.3](#).

726.8.3 No direct payment will be made for the construction of bedding or for bedding material.